

Organic-inorganic hybrid perovskite based nonvolatile resistive random access memory

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Recently, the memory devices are the essential components of most electric device in our daily life. Especially, the random access memory has received great deal attention as promising next-generation nonvolatile memory device due to its simple device architecture, high memory density, fast operation speed, and low power consumption. The ReRAM can deal with the information by resistive switching effect originated from the conductive filament formation, the crystalline-amorphous phase transition, and the charge storing/trapping. Organic-inorganic hybrid perovskite materials exhibited unique phenomenon, which is hysteresis of photocurrent density-voltage curves due to displacement current of ferroelectric materials with multi-domain structures, ions/defects migration by ionic crystalline characteristics of perovskite material, and charge trapping/detrapping in bulk and interface of perovskite material. Accordingly, $\text{CH}_3\text{NH}_3\text{PbI}_3$ perovskite is good candidate for application of RERAM, so that we fabricated the $\text{CH}_3\text{NH}_3\text{PbI}_3$ OHP memory, which is exhibited $> 0.1 \text{ TB/in}^2$ storage capacity, > 600 cycles endurance, $> 10^4 \text{ s}$ data retention time, $\sim 0.7 \text{ V}$ set, and $\sim -0.61 \text{ V}$ re-set bias voltage.